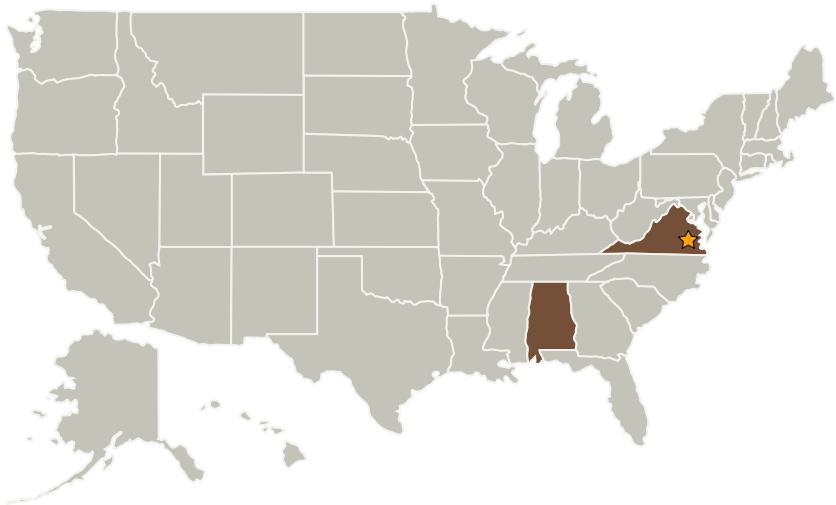
Aeroservoelastic Modeling, Phase I

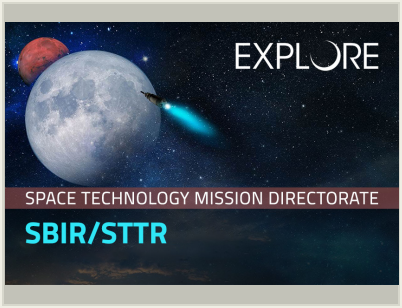
Completed Technology Project (2008 - 2008)

Project Introduction

CFDRC proposes to develop, validate and demonstrate a comprehensive aeroservoelastic analysis framework for aerospace vehicles by enabling coupled interactions between multi-physics simulation modules with variable fidelity for flexible structures, aerodynamics, flight dynamics, and embedded smart materials. In Phase I, a nonlinear electrodynamics finite-element model for smart materials, capable of handling different materials and FEM mesh elements, will be developed. An interface model capable of handling different mesh densities and types for the smart materials FEM model and the structural dynamics (CSD) model will also be developed. A novel grid deformation technology, developed by CFDRC, using Solid Brick Analogy will be enhanced by nonlinear strain theory for large deformations and generalized for mixed elements computational grid systems. The feasibility of the proposed technology will be demonstrated for a fighter aircraft model in buffet mode. In Phase II, the modeling technologies identified in Phase I will be developed and implemented into the framework, with emphasis on developing an advanced data management procedures to increase the efficiency of the simulation framework. Additionally, an interface model between the aeroservoelastic framework and a general control design toolbox will be implemented to facilitate designs of complex control systems to command the smart materials. The developed technologies will then be extensively validated and demonstrated for typical aeroservoelastic simulations.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Essam Sheta

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity